## REMARKS

This Amendment is submitted in response to the Office Action mailed March 20, 2003, wherein the Specification was objected, claims 1-16 were rejected under 35 U.S.C. §112, second paragraph, claims 1-6 were rejected under 35 U.S.C. §103(a). In response, claims 1, 14, and 15, and the Specification have been amended. Applicants respectfully submit that no new matter has been entered by the amendments. Claims 17-20 were previously withdrawn from further consideration. **Claims 1-16 are pending.**

## REJECTION TO THE SPECIFICATION

The disclosure was objected to for indicating Fig. 1, instead of Figs. 1a and 1b of the Drawings. In response, the Specification has been amended in the Brief Description of the Drawings to specifically refer to Figs. 1a and 1b. In addition, the Specification has been amended to explicitly refer to these two drawings.

## REJECTION TO THE CLAIMS

Rejections under 35 U.S.C. §112, second paragraph

Claims 1-16 were rejected under 35 U.S.C. §112, second paragraph as being indefinite. The Examiner has objected to the phrasing in claim 1 of how the liquid polymeric material is dispensed and disposed on the substrate. Applicants have amended claim 1 to rephrase the dispensing of material, and respectfully request that the Examiner withdraw the rejection under §112.

The Specification describes dispensing a liquid polymeric material between a pair of substrates and disposed inwards from the edges of the substrate, and then moving the substrates together to cause the material to flow to the edges. In addition, the Specification describe dispensing the liquid polymeric material on dyes of one or the other of the two substrates. Applicants have amended claim 1 to make express what is implicit in the claim as originally worded. Specifically, the phrase "dispensing a liquid polymeric material ***between*** a conducting surface on a first ... substrate and a conducting surface on a second ... substrate" has been amended to read "dispensing a liquid polymeric material **on one of a** first ... substrate and a conducting surface on a second ... substrate" to recite the dispensing of the polymeric material on one of the two substrates.

Regarding the recitation of disposing the liquid polymeric material inwardly from the edges of the substrate, a reading of the full claim does not render the phrase "disposed inward" indefinite. Specifically, the claim recites dispensing a liquid polymeric material on one of two substrates and disposed inwardly from the edges of the substrates, and then pressing the liquid polymeric material between the substrates so that the liquid polymeric material flows towards the edges of the substrates. The phrase disposed inward refers to the where the material is originally placed on the substrates. The Specification describes several dispensing locations for the liquid polymeric material where the material is on the substrates and way from the edges, including, but not limited to, the location indicated by the Examiner.

Applicants believe that claim 1, and dependent claims 2-16, are now in condition for allowance, and request that the Examiner withdraw the rejection of claim 1-16 under §112.

Rejections under 35 U.S.C. §103

Claims 1-6 were rejected under 35 U.S.C. §103(a) as being unpatentable over Murakami. This rejection is respectfully traversed, as it will be subsequently shown that a *prima facie* case of obviousness has not been established.

Murakami is specifically directed to the problem of mounting a semiconductor device, specifically a flip chip, to a substrate (see, for example, the Field of the Invention in Murakami). Murakami teaches an improved mounting method, where a pad on the substrate is roughened, a resin is placed on the substrate, and a semiconductor device is placed on the resin and solder bumps on the device contact the roughened substrate surface. Murakami also teaches the necessity of roughening a surface prior to connecting the device to the substrate to improve adhesion. Specifically, the process of forming abrasions of specified depth over a least a portion of the surface is detailed (column 3, line 61 – column 4, line 4). Murakami also teaches that improved connections, which are one of the advantages of the invention, are achieved by the combination of the shrinkage of the resin and a mechanical connecting force caused by the contact of abrasions with the solder bump (column 5, lines 25 – 40, and column 6, lines 8 - 17).

Paraphrasing the Examiner, the arguments for this rejection include the statement that one skilled in the art would have readily appreciated that the method of Murakami would work to join substrates as well as joining substrate to device because both involve joining substantially planar and conducting surfaces, and that joining substrates would have involved applying the necessary amount of adhesive. The Examiner thus asserts that it would have been obvious to one

of ordinary skill in the art at the time the invention was made to bond two substrate surfaces in the method of Murakami.

Applicants respectfully disagree with the Examiner's arguments and assertion for the following reasons. Murakami neither anticipates the joining of two substrates nor suggests that the method of Murakami could be modified to join two substrates, as claimed. Applicants have noted in the Background section of the present application that "[c]onventional underfill process ... for flip chip to substrate joining is limited to very small joining areas (typically 1-inch by 1-inch area or less)" (page 2, paragraph 5). The differences in areas being joined (device-to-substrate vs. substrate-to-substrate) present problems in adhering the surfaces that are neither taught nor suggested by Murakami. For example, the method of Murakami relies on the flow of resin between a device and substrate. Applicants respectfully submit that it would not be obvious to one skilled in the art that the required resin flow described in Murakami would be useful or that it could be easily applied to the joining of much larger surface areas, such as a pair of substrates. In addition, the application of the method of Murakami requires the roughening of the substrate opposite each solder bump. A substrate may have a multiplicity of connection points, Applicants respectfully submit that the roughening of a multiplicity of locations on a substrate is not easily accomplished, that Murakami provides no teaching or suggestion as to how to provide the multiplicity of roughened surfaces, and that for this reason it would not be obvious to attempt the method of Murakami for joining substrates.

Applicants respectfully submit that a *prima facie* case of obviousness has not been established for the above reasons. Specifically, no combination of prior art references teach or suggest all of the claim limitations, and there is no suggestion to modify the prior art to obtain the claimed invention. The claimed invention is directed to the joining of two substrates which is neither taught nor suggested by Murakami, any of the other references, or in the knowledge generally available to one of ordinary skill in the art. In addition, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify Murakami or to combine reference teachings for the reasons discussed above. The method of Murakami is limited to joining a chip to a substrate, and none of the reference teach or suggest the modification of Murakami to join substrates. For these reasons, Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness of independent claim 1, and request that the rejection of claim 1 and dependent claims 2-6 under §103 be withdrawn.

Claims 1-6 were rejected under §103(a) as being unpatentable over Chen et al. This rejection is respectfully traversed, as it will be subsequently shown that a *prima facie* case of obviousness has not been established.

Chen et al. teaches connecting circuit layers by providing solder bumps on a layer, depositing an adhesive layer over one of the circuit layers, and contacting the circuit layers. The adhesive of Chen et al. is essentially a non-moving adhesive layer that covers a surface and that accommodates the contacting circuit layers only in the immediate vicinity of the bumps. Specifically, Chen et al. is directed towards providing an adhesive layer over the entire circuit layer, and provides for the flow of adhesive only in the vicinity of the solder bumps. While Chen et al. does disclose displacing the adhesive layer near the bump, as noted by the Examiner, this is in the context of a preformed layer of adhesive adjusting to the deformation of a bump while the surfaces are forced together.

Applicants respectfully submit that a *prima facie* case of obviousness has not been established for the following reasons. First, there is no suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify Chen et al., or to combine reference teachings to obtain the claimed invention. Chen et al. teaches applying an adhesive layer on one component, then contacting the adhesive with a second component having a bump. In contrast, the inventive method produces an assembly of substrates by dispensed a material on a substrate, pressing the material between the substrate and an opposing substrate, and curing the material. The method claims dispensing the material away from the substrate edges and having it flow towards the edges when pressing the substrates together. There is no teaching or suggestion in Chen et al. of dispensing the adhesive only on a portion of the circuit layer and having it flow, as a result of pressing, across the substrates. The method of Chen et al. is thus very different from that of the present invention, and there is no suggestion in either Chen et al. or the other reference to modify Chen et al. to obtain the invention of independent claim 1.

For these reasons, Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness, and request that the rejection of claim 1, and of dependent claims 2-6, under §103 be withdrawn.

Rejection of claims 7-9 and 16 under 35 U.S.C. 103(a)

Claims 7-9 and 16 were rejected under 35 U.S.C. §103(a) as being unpatentable over Murakami or Chen et al., in view of Wang or Konarski et al. Applicants submit that neither Wang nor Konarski et al. are valid references under 35 U.S.C. §102. The rejection of claims 7-9 and 16 under §103 is thus not well-founded. In addition, the remaining references fail to establish a *prima facie* case of obviousness, and Applicants respectfully request that the rejection of claims 7-9 and 16 under §103 be withdrawn.

Konarski et al. has an effective filing date of January 8, 2001 and the present application also has a filing date of January 8, 2001. Since Konarski et al. was not applied for before the filing date of the present invention it is not a valid reference under §102(e).

Applicants respectfully submit that Wang is also not a valid §102 reference. Wang has an effective filing date of September 21, 2000 and an issue date of October 12, 2002, and as such can only be a reference under §102(e). The attached Declaration of Albert W. Chan under 37 C.F.R. §1.131 establishes that the present invention was reduced to practice in the United States prior to September 21, 2000, i.e., before the U.S. filing date of Wang. As such, Wang is not available as a reference under §102(e).

Since neither Konarski et al. nor Wang is a valid §102 reference the rejection is not well-founded. In addition, for the reasons described above, the combination of the remaining references to Murakami and Chen et al. fail to establish a case of *prima facie* obviousness. Accordingly, Applicants respectfully request that the rejections of claims 7-9 and 16 under §103 be withdrawn.

Rejection of claims 10-13 under 35 U.S.C. 103(a)

Claims 10-13 were rejected under 35 U.S.C. §103(a) as being unpatentable over Murakami or Chen et al., in view of Wang or Konarski et al., and further in view of Stefanowski. Applicants have shown that neither Wang nor Konarski et al. is a valid reference under §102. The rejection of claims 10-13 under §103 are thus not well-founded. In addition, the remaining references fail to establish a *prima facie* case of obviousness, and Applicants respectfully request that the rejection of claims 10-13 under §103 be withdrawn.

There is no teaching or suggestion in Stefanowski to modify the other references to obtain the claimed invention, and thus, for the reasons described above, the combination of Murakami or Chen et al. in combination with Stefanowski fail to establish a case of *prima facie*

obviousness. Accordingly, Applicants respectfully request that the rejections of claims 7-9 and 16 under §103 be withdrawn.

**ALLOWABLE SUBJECT MATTER**

Examiner has indicated that claims 14 and 15 would be allowable if rewritten to overcome the rejection under §112 and include all of the limitations of the base claim and any intervening claim. Applicants have amended claim 1 to address the rejection under §112 and claims 14 and 15 to include the base clam and any intervening claim. Applicants respectfully submit that claims 14 and 15 are in condition for allowance.

In view of the remarks made above, applicants respectfully submit that the application is in condition for allowance and action to that end is respectfully solicited. If the Examiner should feel that a telephone interview would be productive in resolving issues in the case, he is invited to telephone the undersigned at the number listed below.

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Respectfully submitted,

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